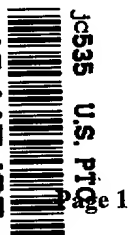


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UNITED STATES CONTINUING UTILITY PATENT APPLICATION
under 37 C.F.R. § 1.53(b)

Atty. Docket No. 01263.59651

Assistant Commissioner of Patents
Box Patent Applications
Washington, D.C. 20231

Enclosed herewith is a continuing patent application and the following papers:

First Named Inventor (or application identifier): Elizabeth A. Smith

Title of Invention: Interactive Subscription Television Terminal (As Amended)

- ☐ Continuation
☒ Divisional
☐ Continuation-in-Part

of prior application No. 08/265,941, filed June 27, 1994

1. ☒ Specification 22 pages (including specification, claims, abstract) / 14 claims (2 independent)
2. ☒ Declaration/Power of Attorney:
 - ☒ Copy from Prior Application (for continuation or divisional application)
 - ☐ Newly Executed Declaration (for CIP application)
 - ☐ Deferred under 37 C.F.R. § 1.53(f)
 - ☐ Deletion of Inventor(s) - Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b)
 - ☒ Incorporation by Reference - The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein
3. ☒ 6 Distinct sheets of ☒ Formal ☐ Informal Drawings
4. ☒ Preliminary Amendment
5. ☒ Information Disclosure Statement
 - ☒ Form 1449
 - ☐ A copy of each cited prior art reference
6. ☒ Assignment
 - ☐ Assignment with Cover Sheet attached
 - ☒ Assignment filed in prior application. Application assigned to: **Scientific-Atlanta, Inc.**
7. ☐ Priority is hereby claimed under 35 U.S.C. § 119 based upon the following application(s):

UNITED STATES CONTINUING UTILITY PATENT APPLICATION
under 37 C.F.R. § 1.53(b)

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Country	Application Number	Date of Filing (day, month, year)

8. ☐ Priority document(s)
9. ☐ Small Entity Statement
☐ Small Entity Statement was filed in prior application, Small Entity Status is still proper and desired
☐ is attached
☐ is no longer claimed
10. ☐ Microfiche Computer Program (Appendix)
11. ☐ Nucleotide and/or Amino Acid Sequence Submission
☐ Computer Readable Copy
☐ Paper Copy (identical to computer copy)
☐ Statement verifying identity of above copies

12. Calculation of Fees:

FEE FOR	EXCESS CLAIMS	FEE	AMOUNT DUE
Basic Filing Fee (37 C.F.R. § 1.16(a))			\$790.00
Total Claims in Excess of 20 (37 C.F.R. § 1.16(c))	0	22.00	\$0.00
Independent Claims in Excess of 3 (37 C.F.R. § 1.16(b))	0	82.00	\$0.00
Multiple Dependent Claims (37 C.F.R. § 1.16(d))	0	270.00	\$0.00
Subtotal - Filing Fee Due			\$0.00
REDUCE BY (%)(\$)			
Reduction by 50%, if Small Entity (37 C.F.R. §§ 1.9, 1.27, 1.28)	0		\$0.00
TOTAL FILING FEE DUE			\$0.00
Assignment Recordation Fee (if applicable) (37 C.F.R. § 1.21(h))	0	40.00	\$0.00
GRAND TOTAL DUE			\$790.00

13. PAYMENT is:

- ☒ included in the amount of the GRAND TOTAL by our enclosed check. A general authorization under 37 C.F.R. § 1.25(b), second sentence, is hereby given to credit or debit our Deposit Account No. 19-0733 for the instant filing and for any other fees during the pendency of this application under 37 C.F.R. §§ 1.16, 1.17 and 1.18
- ☐ not included, but deferred under 37 C.F.R. § 1.53(f).

UNITED STATES CONTINUING UTILITY PATENT APPLICATION
under 37 C.F.R. § 1.53(b)

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Atty. Docket No. 01263.59651

14. All correspondence for the attached application should be directed to:

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15. Other: _____

Date: December 15, 1997

By: Gary D. Fedorukh #35,509
for Michael J. Shea
Reg. No. 34,725

MJS/GDF/vr

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PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

In the Application of:)
)
Elizabeth A. SMITH et al.) Group Art Unit: Unassigned
)
Application No.: CPA Divisional of) Examiner: Unassigned
serial no. 08/265,941)
)
Filed: December 15, 1997) Attorney Docket No.:1263.59651
)
For: INTERACTIVE SUBSCRIPTION)
TELEVISION TERMINAL)
(As Amended)

PRELIMINARY AMENDMENT

Honorable Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend the above-captioned application as follows:

IN THE TITLE:

Please change the title of the invention to --Interactive Subscription Television Terminal--.

IN THE SPECIFICATION:

Amend the specification by inserting before the first line the sentence:

-- This application is a division of application Serial No. 08/265,941, filed June 27, 1994; which is a continuation of 07/960,261, filed October 13, 1992 (now U.S. Patent No. 5,355,480); which is a continuation of 07/342,987, filed April 20, 1989; which is a continuation of 07/289,218, filed December 23, 1988 (now U.S. Patent No. 4,987,486. The entire disclosure

of the prior application, from which a copy of the oath or declaration is supplied is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein. --"

IN THE CLAIMS:

Please cancel claims 1-14 and add the following new claims:

--15. (NEW) A method for use in an interactive television system, comprising the steps of:

transmitting a video signal and a plurality of first operation data from a system manager, the first operation data associated with user inputs at a subscriber terminal during a first mode, each first operation data identifying a particular operation;

receiving the video signal and the first operation data at the subscriber terminal;

storing the first operation data;

receiving a user input;

generating upstream data according to the user input; and

transmitting the upstream data to the system manager.

16. (NEW) The method of claim 15 further comprising the steps of:

transmitting second operation data to the system manager; and

receiving the second operation data at the subscriber terminal.

17. (NEW) A method for use in an interactive television system, comprising the steps of:

storing operation data, the operation data associated with at least one user input during a first mode, the operation data identifying a particular operation;

receiving a user input;

comparing the user input with the operation data stored; and

performing an operation corresponding with the operation data which matches the user input during the first mode, or an operation associated with the user input during a second mode.

18. (NEW) The method of claim 17 further including the steps of transmitting the operation data from a system manager and receiving the operation data at a subscriber terminal prior to said step of storing.

19. (NEW) A method for use in an interactive television system comprising the steps of:

storing a key template map for associating a particular key of a keypad with an operation to be performed by a processor during a first mode;

displaying a background video signal;

displaying on the background video signal a screen including an operation prompt during the first mode;

receiving a key input;

comparing the key input with the key map to determine an operation from the screen including the operation prompt during the first mode; and

performing the operation from the screen including the operation prompt during the first mode, or another operation associated with the key input during a second mode.

20. (NEW) The method of claim 19 further including the step of downloading the key template map from a system manager.

21. (NEW) An interactive television system comprising:

a display for displaying a background video signal and during a first mode displaying on the background video signal a screen including an operation prompt;

a memory for storing a key template map in which a particular key input is assigned an operation from the screen including the operation prompt displayed during the first mode;

a keypad for receiving a key input;

a processor, responsive to the key input, for comparing the key input with the key map to determine an operation from the screen including the operation prompt assigned to the key input during the first mode and performing the operation during the first mode, and for performing another operation associated with the key input during a second mode.

22. (NEW) The interactive television system of claim 21 further comprising a system manager for downloading screen data including the key template map to the memory.
23. (NEW) The interactive television system of claim 22 wherein the screen data further includes attribute data for defining display characteristics, the display displaying during the first mode in accordance with the attribute data.
24. (NEW) The interactive television system of claim 21 wherein the keypad includes a remote control keypad which communicates with said processor via infrared communication signals.
25. (NEW) The interactive television system of claim 21 wherein the operation prompt identifies a program routine for interactivity.
26. (NEW) The interactive television system of claim 21 wherein the background video signal includes a video signal representing a plain colored screen or an incoming video signal.--

REMARKS

Favorable consideration and allowance of the instant application are respectfully requested. Claims 1-14 have been cancelled. Claims 15-26 have been added. Applicants have amended the specification to correct various informalities. If the fees accompanying the instant amendment differ from the Patent Office charges, please charge or credit any variance to Deposit Account 19-0733.

Respectfully submitted,

BANNER & WITCOFF, LTD.

Dated: December 15, 1997

By: Gerry D. Fedoruk #35,509
for Michael J. Shea
Registration No. 34,725

1001 G Street, N.W., 11th Floor
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Date: December 15, 1997

STORAGE CONTROL METHOD AND
APPARATUS FOR AN INTERACTIVE
TELEVISION TERMINAL

This application is a continuation-in-part of application Serial No. 289,218, filed December 23, 1988, and entitled "Automatic Interactive Television Terminal Configuration" and is related to U.S. Application Serial Nos.: _____, (Attorney Docket No. 25,871), entitled "Cable Television Transaction Terminal"; _____, (Attorney Docket No. 25,872), entitled "Terminal Authorization Method"; _____ (Attorney Docket No. 25,874), entitled "Terminal Polling Method"; _____, (Attorney Docket No. 25,877), entitled "Interactive Television Terminal with Programmable Background Audio or Video"; and _____, (Attorney Docket No. 25,878), entitled "Interactive Room Status/Time Information System", filed concurrently herewith.

TECHNICAL FIELD

This invention relates generally to two-way interactive cable television systems in which entertainment services, information and data signals are provided over cable facilities from a system manager location to a user location, and more particularly to a method and apparatus for controlling the storage of data in local storage at the user location.

BACKGROUND OF THE INVENTION

Two-way interactive cable television systems are known for transmitting entertainment, information and data signals over a cable facility toward a plurality of users. Data may be transmitted and addressed to a particular subscriber over a separate data channel or over a so-called "in-band" data channel. In a downstream direction, addressed control data may represent services authorized to a particular terminal or control commands to that terminal. In an upstream

direction from a terminal to the service provider or system manager location, control data may represent selections made by a user in response to a polling request or at the time of user selection.

In a hotel environment, the system manager delivers video signals, e.g., television programming, to user terminals located, for example, in various hotel rooms over cable lines, and the system manager also transmits digital messages to receivers at each room location. Similarly, information and data generated at each room are transmitted upstream to the system manager via the cable.

It is known in the prior art to provide an interactive terminal at a user location including a local processor for controlling access to a host computer located at the system manager location and a local data store connected to the local processor. Such terminals also normally consist of a display for displaying messages to the user or details of the transaction being conducted, and a keyboard or remote key pad comprising a number of keys by which the user can enter data and initiate functions.

Typically, a central data storage is provided at the system manager location for storing a complete data base, and a smaller subset of that data base is maintained in the local store at the user terminal. Because faster response times can be achieved if a requested transaction can be completed without the need for repeatedly accessing the central data base, configuration of the local store becomes an important design consideration. Prior methods of local storage management have been based upon last use or recency of use, and systems are also known in which those items in the data base most frequently requested by the user terminals are retained in the local store. These methods have not, however, been entirely satisfactory, and have not uniformly achieved the desired reduction in response time. Accordingly, there is a need for a more efficient technique for choosing data items to be stored in a local storage of an interactive terminal system.

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SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved method of local storage management for an interactive terminal which ensures faster response times and which reduces the need for repeatedly accessing the central data base.

It is another object of the present invention to provide a method of local storage management for an interactive terminal which updates the local store in accordance with the relative priority of data entries.

It is still another object of the present invention to provide a method of local storage management which updates the local store in accordance with the system service requested by the user.

An interactive terminal, according to the present invention, comprises a processor, a local data store connected to the processor, a character generator responsive to processor control for generating a television signal output to an associated television receiver, a key pad or remote control for inputting information to the processor, and a power supply input.

In a hotel environment, the interactive terminals are located in individual hotel rooms and are coupled, via 2-way RF communications, to a central hotel location, designated as the system manager, where the terminals are accessed by polling for monitoring and servicing the guests' requests. The local storage capacity of the interactive terminal is provided for storing data and a number of character screen commands, accessed from a central data base at the system manager, for use in generating prompting screens displayed on the television receiver. Thus, in use, a hotel guest may call for a variety of services, e.g., pay TV programs, room service and the like, by operating the input keys of the key pad to cause a prompting screen to be displayed on the television receiver.

According to the invention, character screen commands are stored at the terminal according to an assigned priority. The stored screen commands also include pointers which are used by the terminal processor to prefetch other screens which follow the current screen in a decision tree structure manner. These screens are downloaded

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from the system manager for storage at the terminal so that they are available for display if and when called for. In operation, if a particular branch of a decision tree is not selected by the user, screens associated with that branch are deleted from terminal memory as needed to make room for new screens. The terminal memory is also controlled so that character screen commands are swapped in and out of memory based on their relative priority.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block schematic diagram of an interactive entertainment system in accordance with the present invention applied in a hotel or hospital system environment comprising automatically configurable two-way interactive terminals.

Figure 1a is a block schematic diagram of system manager 12 of Figure 1.

Figure 2 is a block schematic diagram of a two-way interactive terminal according to the present invention comprising a microprocessor, a memory, a character generator, a key pad and a television signal output to an associated television receiver.

Figure 3 is a schematic diagram showing the data types stored within the screen data area of RAM 217 of Figure 2.

Figure 4 is a schematic diagram showing the data structure of character screen commands stored in RAM 217 of Figure 2.

Figure 5 is a schematic diagram showing the data structure of the key template shown in Figure 4.

Figure 6 shows a number of exemplary display screens and associated key templates for the in-room checkout feature.

Figure 7a is a block diagram showing the tree structure of a fan-out type feature.

Figure 7b is a block diagram showing the tree structure of a serial chain type feature.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1, there is shown a block schematic diagram of an interactive entertainment system in accordance with the present invention. The depicted embodiment relates to its application in a hotel or hospital system environment, however, the present

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invention is not so limited, and may be applied in any two-way interactive entertainment system such as a cable or satellite television entertainment system involving a distribution network comprising trunk lines and feeder cables of optical or coaxial cable. For example, satellite receiver and decoder 3, cable receiver and descrambler 4, video modulator 5, addressable transmitter receiver 10, locally generated video modulator 11, and system manager 12 may all be located at the location of a cable television system head end. In this example, coaxial cable or optical fiber link 6 can connect the cable television head end to two-way interactive terminals 7, 8 or 9 of the entertainment system located at individual subscriber premises.

On the other hand, the embodiment of Figure 1 is especially exemplary of the application of the present invention in a hotel or hospital entertainment system. Transmission link 6, then, may simply comprise a coaxial or optical fiber cable link between an entertainment control center and a plurality of terminals, for example, terminals 7, 8 or 9 located in rooms of the facility.

In particular, at the system control center, a satellite signal may be received at satellite antenna 2 and then received and decoded at satellite receiver decoder 3 for distribution via modulator 5 over a distribution cable 6 to the interactive terminals 7, 8 or 9 of the present invention. Additionally, a band of cable television channels received over cable facilities 1 are received and, if necessary, descrambled at cable receiver/descrambler 4. The descrambled video signals are then modulated at modulator 5 for distribution over facilities 6 to interactive terminals 7, 8 or 9. If desired, an optional scrambler may be provided for scrambling premium channel transmissions to interactive terminals 7, 8, or 9. Of course, terminal 7, 8, or 9, then, would comprise descrambler circuitry capable of descrambling the scrambled premium channel transmissions. Such circuitry is not shown in either Figure 1 or 2 but would be preferable in a system involving distribution of signals to remote subscriber locations.

According to the exemplary embodiment of Figure 1, the hotel or hospital location may be connected to other hotels or hospitals via data link 14. Over data link 14, data may be received via modem 13

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at system manager 12. In this manner, the hotel or hospital system manager may maintain current status of all features and all interactive terminals of an entertainment system comprising a plurality of hotels. For example, entertainment schedules may be distributed over the data transmission link from a network control center where the entertainment schedule is composed. System manager 12 comprises a data processing unit and appropriate memory for storing status and features associated with all terminals in the system. System manager 12 also controls the generation of video channels at modulator 11, if necessary, for transmission over facility 6 to the two-way interactive terminals 7, 8 or 9. In particular, modulator 11 comprises the capability to generate signals for actuating the display of character screens at terminal locations responsive to the control of the system manager 12 in the event, for example, that terminals are unable to generate the character screens themselves.

The generation of complete screens of characters for transmission to a terminal according to the present invention for display is not required because the terminal (Figure 2) comprises its own character generator 204. Consequently, locally generated video modulator 11 is optional. Instead, system manager 12 generates commands to generate screens, and not the screens themselves, for transmission via addressable transmitter 10 to an interactive terminal according to the present invention. In a "hybrid" system comprising terminals having no character generator and terminals according to the present invention, locally generated video modulator 11 would be necessary. The screens generated either at the terminal or by way of modulator 11, for example, may relate to the provision of information to guests or patients about hotel or hospital services, respectively.

Also according to Figure 1, system manager 12 controls an addressable transmitter/receiver 10 for transmitting addressed communications which are uniquely addressed to terminals 7, 8 or 9 and receiving communications at random times or in response to polling requests of terminals. The addressable transmitter 10 according to Figure 1 may transmit addressed information on a separate data carrier, for example, at 108 megahertz and receive information

transmitted in a so-called upstream direction from the terminals on another separate data channel at 25 megahertz. In an alternative embodiment, all downstream communications may be transmitted in band or within a particular television channel transmission, for example, within the horizontal or vertical intervals of transmitted video signals. Consequently, the system manager 12 accomplishes in band signaling by controlling data input into the video signals transmitted via either modulators 5 or 11 (not shown). A separate data carrier for each direction of transmission may be preferred due to the increased data carrying capacity. For upstream transmission, a telephone line or spread spectrum transmission may be employed as an alternative to a separate data channel.

Referring to Figure 1a, system manager 12 particularly comprises a processor 100, an associated memory, ROM, for storing control algorithms, a read/write memory, RAM, for storing a plurality of character screens, a display screen 101 and a keyboard 102 for screen design and modification. An optional printer 103 is also provided for printing out room checkout bills in a similar manner as would occur at a hotel front desk during checkout.

Besides specifically addressed data communications with the interactive terminals 7, 8 or 9, the system manager may also address communications globally to all interactive terminals which communications may or may not require a terminal to respond. Such global communications, for example, may be addressed to a global address representing all terminals in the particular hotel system or to a group address representing a group of terminals within the system having a commonality of interest.

Referring to Figure 2, there is shown a two-way interactive terminal according to the present invention. The terminal is coupled via facility 6 to video modulator 5, addressable transmitter/receiver 10, and locally generated video modulator 11, if provided, as shown in Figure 1.

In particular, a two-way interactive terminal according to the present invention comprises an up/down converter 201 for converting channels received over the facility 6 for display at an associated

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television receiver (not shown) or for transmitting data modulated to 25 megahertz by data transmitter 203 for transmission over facility 6. Up/down converter 201 passes data on the separate data carrier at 108 megahertz for demodulation and reception at data receiver 203. Received television entertainment signals are provided by up/down converter 201 to demodulator 202 which also provides automatic frequency control and gain control of up/down converter 201. Demodulator 202 provides video via on screen character generator 204 to channel 3/4 modulator 205. In this manner, on screen character generation may appear superimposed upon an incoming video signal or displayed in the form of a teletext screen, for example, text on a plain colored background. Also at demodulator 202 the baseband audio channel is transmitted to audio output 211 or via channel modulator 205 to the television receiver at radio frequency. In addition, a baseband video output 213 may be provided from on screen character generator 204 at video output jack 213.

The interactive terminal of the present invention further comprises a processor 206 for controlling data transmission and reception at data receiver/transmitter 203. Processor 206 also controls character generation at character generator 204 via gate array 207. Also via gate array 207, the processor 206 controls a key pad 216 which may be directly coupled to the gate array or coupled via infrared or other remote control transmission link receiver 208. Random access memory (RAM) 217, provided with backup power by capacitor 218, stores character screen commands, downloaded feature data and other data received over the data transmission link via data receiver 203 from the system manager responsive to processor 206 control. The processor 206 also has access to a nonvolatile random access memory 222 and access via gate array 207 to an outboard read only memory (ROM) 219. Processor 206 receives remote control key commands from a remote control key pad via infrared or other remote control transmission receiver 208. Processor 206 may also control the operation of a phase lock loop 209 and bandpass filter 210 for controlling operation of the up/down converter 201.

Power is supplied via an alternating current input to power supply 215 which provides, for example, a plus 5 volt and a plus 12 volt DC input to various components of the terminal requiring such power. Furthermore, the alternating current power input to power supply 215 may be provided via a controlled switched outlet 214 to an associated device such as the television receiver associated with the terminal. The state of the switched outlet 214 is controlled via gate array 207 by processor 206. For example, the switched outlet 214 may continuously provide power to its associated device or provide power only when an "on" button of key pad 216 or a remote control key pad is set to an on condition.

Values inside of boxes or associated with boxes are exemplary of memory sizes, clock rates, or component types. For example, clock 220 for clocking the microprocessor operation may operate at 14.318 megahertz. The clock signal is divided down by gate array 207 for operation of the microprocessor 206 which may be a Motorola MC 6803U4 or for clocking other processes of the terminal. The on screen character generator 204, for example, may be a Mitsubishi M50455 component. RAM 217 may comprise 16 kilobytes of memory and ROM 219 may comprise 32 kilobytes of memory.

Referring now to Figures 2-8, the method for controlling storage of screen data in RAM 217 of the interactive terminal will now be described. Referring first to Figures 2 and 3, in the preferred embodiment, RAM 217 comprises a screen data area which is divided into a plurality of data blocks. Six data blocks are shown in Figure 3, however, in the preferred embodiment, RAM 217 is divided into forty seven (47) such blocks. Each data block is comprised of 292 characters, and may contain any one of three types of data, i.e., header data, communications data and screen data. Data in each data block is uniquely identified by a screen number, which is stored at the beginning of the data block, and this screen number also identifies the data "type". In the preferred embodiment, header data have a screen number of 127, screen data have screen numbers in the range of 128-1023, and communications data have screen numbers over 1023.

A Feature Start screen is next in the priority order. The Feature Start screen is the first screen of each feature, e.g., room service, in-room checkout, to be displayed to the user when the feature is selected. A channel map stored in RAM 217 correlates key pad entered channel numbers with either an EIA channel frequency to which the television receiver is to be tuned or with a unique screen number. The channel map thus correlates each of the Feature Start screens with a predetermined user entered channel number so that the Feature Start screen of a particular feature is displayed whenever the user enters the predetermined channel number via key pad 217 (Figure 2). For example, in Figure 6, channel 20, entered via key pad

217, is associated with Feature Start screen 490 of the in-room check-out feature. Other channel keyboard entries activate the terminal to tune to an EIA (Electronic Industries Association) channel frequency for receiving a color television signal.

The third screen type is "Other", and "Other" screens rank last in the priority order. These screens are, thus, the first to be analyzed for possible replacement to make room for other screens of higher priority or associated with the feature currently being viewed by the user, as will be explained. Once the "Other" screen area is exhausted, i.e., when no "Other" screen remain in memory which can be removed to make room for incoming screens, the other data types, i.e., Feature Start screens, Special screens, communications data, and header data, are also analyzed in reverse priority order, for possible deletion.

Focusing more specifically on the screen data, the data structure of the character screen commands stored in RAM 217 is shown in Figure 4. Briefly, as shown in the figure, the screen data consist of a screen number in the range of 128-1023 which is used, as explained above, to uniquely identify the particular screen. Also associated with each screen is a priority number in the range from 0-7, with 0 being the highest priority and 7 being the lowest priority; a cannibal bit, which aids in swapping screen commands in and out of memory, as will be explained; a type field which indicates the screen type, i.e., Special, Feature Start, or Other; a channel number indicating the channel of any background video or audio associated with the screen; an audio field for indicating whether background audio is being used; a feature number field for identifying the feature scenario, i.e., room service, in-room checkout, etc., of which the screen is a part; a time out field for specifying the maximum viewing time of the screen; a key template map for associating a particular key of the key pad with a particular operation to be performed by processor 206; a text field which contains the actual text to be outputted on the television receiver; and an attribute field for defining the screen display characteristics, e.g., the color and intensity of the background, the size of the characters, the character blink rate and the like.

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The key template structure is shown in Figure 5, and specifies for a particular key of the key pad the action to be taken, e.g., prefetch a screen, and/or the screen or channel, i.e., the go-to screen, to be displayed or tuned, respectively at the user terminal when the key is depressed. In the preferred embodiment, key pad 216 is a hand-held battery operated unit and comprises a total of 18 keys which may be programmably defined for each display screen to cause a particular action to be performed and/or to cause a go-to screen to be displayed. The effect of the go-to screen of the key template is to create a decision tree or hierarchical screen structure, in which each character screen command contains one or more pointers from which one or more other screens may be accessed.

An example of the key template is shown in Figure 6 for the in-room checkout feature. As shown in the figure, when the checkout feature is initiated by entering channel 20 on key pad 217, screen 490, which is the Feature Start screen, appears. Screen 490 includes a number of instructions which direct the user to depress the "1" key of key pad 216 to review charges; the "2" key to check out; and the "No" key to exit the feature. A key template is also associated with screen 490, and correlates each of keys 1, 2 and "No", i.e., the expected user responses, with particular actions. Thus, in the example, key 1 causes screen 491 to be displayed; key 2 causes screen 501 to be displayed; and "No" causes the video to be brought up.

In addition to directing action at the user terminal, a key template is also provided, as shown in Figure 6, to direct certain processing at the system manager location in accordance with the user depressed key. Thus, in the example, depression of key 1 in screen 490 causes the system manager to process the user request and to transfer room charges to the user terminal for display on screen 491. Depression of key 2 causes the system manager to process the total charges for the room, which are displayed on screen 501 and depression of key 3 causes no action at the system manager.

Key templates for the user terminal and system manager are similarly associated with each of the expected key responses of screens 491 and 501, as shown in Figure 6.

There are two basic types of features and, thus, two different types of decision tree structures shown in Figures 7a and 7b. In the "fan-out" type feature (Figure 7a), the key templates, associated with the screens of the feature, direct the flow of screens so that one of a number of screens located one level below the current screen in the tree structure is displayed responsive to user selection. Once a screen associated with a particular branch of the tree is selected, other screens associated with unselected branches will not be accessed and can, therefore, be considered for deletion, as will be explained. Thus, for example, as shown in Figure 7a, a user viewing screen 60 may directly access any one of screens 71-77, however, once a particular screen, for example, screen 71, is selected, none of screen 72-77 will thereafter be used. Screens 72-77 can, therefore, be replaced, as needed, by other screens, for example, screens (not shown) following screen 71 in the tree structure, which are likely to be requested by the user.

In contrast to the fan-out feature, in the serial chain type feature (Figure 7b), the key templates of the associated screens direct the flow of screens so that the user either sequentially progresses from one screen to the next in the chain or skips back and forth along the chain. The in-room checkout feature shown in Figure 6 is an example of a serial chain type feature.

Besides the key template, a cannibal bit, shown in Figure 4, is also associated with each screen and is used in controlling the storage of screen data in RAM 217. The cannibal bit has a value of either 0 or 1. The normal state of the cannibal bit is 1, but the cannibal bit is configured as 0 in some screen commands to ensure that the screen is retained in memory. This is particularly useful in dealing with features of the serial chain type. As will be explained, when it is desired to store a screen command in RAM 217 and the screen data area is full, processor 206 will first try to remove screens of type "Other" which belong to a feature other than the feature currently selected. However, if only screens of the current feature exist in memory, processor 206 will scan the list of "go-to" screens for the screen currently being viewed and will delete any screen that is not a direct

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"go-to." This has the effect of deleting screens associated with unselected branches of the decision tree and is effective in fan-out type features to remove unneeded screens. If the current feature is a serial chain type feature, it is desirable to maintain all or most of the screens of the feature in terminal memory. But because many of these screens are not directly accessible, i.e., will not be "go-to's" of other screens, some screens may be deleted. To avoid this situation, the cannibal bit is configured as "0", which signals processor 206, as will be explained, to retain screens of the same feature in terminal memory without regard to the direct "go-to's."

As will be easily understood, the speed at which the system responds to a user request will largely depend upon whether a particular screen is stored locally or whether there is a need to access the central data base at the system manager location. Storage of all screens locally is impractical because this would require too much local storage. However, access is significantly improved by appropriately configuring the local store so that at any given time, the screens most likely to be requested are available in the terminal memory ready for display.

As explained above, when a user desires to activate a particular feature, e.g., in-room checkout, he first enters a predetermined channel number via the terminal keyboard associated with the feature in the channel map. This then causes the first screen of the selected feature to be displayed on the television receiver. The user may then follow the instructions on the screen to proceed through a sequence of screens associated with the selected feature.

In operation, whenever a user initiates a feature or requests a particular service by depressing a key of the key pad, processor 206 first determines whether the requested screen, i.e., either the Feature Start screen or the "go to" screen associated with the depressed key, is present in RAM 217. If it is, then the screen is accessed for display. If the screen is not present in RAM 217, processor 206 issues a screen request to the system manager which responds by issuing an "Add screen" command to processor 206 for the requested screen.

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Aside from requesting a screen from the system manager when the processor determines that a screen requested by a user does not currently reside in memory, processor 206 may also prefetch screens into memory prior to their actual use. This prefetch function is tied to user viewing so that when a user views a screen, screens directly accessible by it, as defined by key template go-to's, and not already stored in memory, will be requested. It is also desirable once a user request has been completely serviced and the user is no longer waiting for a screen, e.g., because he is watching television or because he has left the room, to reconfigure terminal memory to an initialized state. Processor 206 will, thus, check a Special screen list maintained in RAM 217 to determine whether there are Special screens which are not already stored in memory, and if there are, these screens will be requested. The channel map will also be searched to identify the screen numbers of all Feature Start screens, a comparison will be made with those screens existent in terminal memory, and any Feature Start screens not present in memory will also be requested.

The basic mechanism for adding screens to RAM 217 is through the "Add screen" command and its companion "Conditional add screen" command. The "Add screen" command is issued by the system manager to processor 206 responsive to a screen request by the user terminal or when the system manager has a new screen to add to the configuration. The "Conditional add" is issued when the system manager wishes to address a screen globally to all of the interactive terminals in the system, and may also be used to address a screen to a particular terminal.

In operation, when the "Add screen" command is issued, processor 206 determines whether vacant space is available in RAM 217 for storing the incoming screen. If space is available, the new screen is stored in the first empty location, and the Priority List is updated so that the memory address of the new screen is appropriately positioned in the list in accordance with the relative priority of the screen. Otherwise, if the RAM is full, it is necessary to remove screen data from RAM 217, and the algorithm described below is used for this purpose.

If the user is currently viewing a screen and all of the "Other" screens in RAM 217 are associated with the current feature, processor 206 examines the cannibal bit of the incoming screen. If the cannibal bit is 1, processor 206 searches the "Other" screens, again beginning with the screen having the lowest priority, to locate screens not directly accessible from the current screen, i.e., screens that are not direct "go-to's" of the current screen. If a non-go-to screen is located, that screen is replaced by the incoming screen.

If no "Feature start" screen is found which can be removed, a similar search is made of the Special screens, and the Special screen having the lowest priority will be removed. Again, no screens of 0 priority will be removed.

If no suitable screen can be found for removal, another search is performed depending upon whether the incoming screen was requested by the user terminal. This will generally mean that the screen is essential for continued operation. Thus, if the new screen is the result of a screen request, processor 206 will replace the lowest

priority screen in memory, disregarding screens with a 0 priority, with the new screen.

The other mechanism for adding screens to RAM 217 is the "Conditional add screen" command which allows the system manager to address a screen globally to all of the interactive terminals in the system or to a particular terminal. The add command is "conditional" in that each terminal determines whether or not it will accept the new screen and, if the screen is accepted, will make room for the screen in accordance with the algorithm described above.

In determining whether a particular screen will be accepted, processor 206 first determines whether the screen corresponds to, i.e., has a same screen number as, a screen currently residing in memory. If it does, then the old screen is replaced with the new screen data.

If the user is watching television, i.e., is not requesting a system service, at the time the "Conditional add" command is issued, processor 206 will also accept and store all "Feature start" screens and all "Special" screens. This ensures that those screens critical to system operation as well as those screens likely to be needed and requested first are available for immediate display.

If, on the other hand, the user is viewing a screen at the time the "Conditional add" command is issued, the criteria for accepting the incoming screen are different. In particular, if the terminal is currently waiting for this particular screen, the screen will be accepted. Otherwise, "Special" screens and "Feature start" screens with a priority of 0 will be accepted, and "Other" screens will be accepted only if the new screen has the same feature number as the screen currently being viewed and is either a direct "go-to" of the current screen or has a cannibal bit of 0.

This invention has been described in detail in connection with the preferred embodiment. However, it will be easily understood by those skilled in the art that other variations and modifications can be made within the scope of the invention as defined by the appended claims.

CLAIMS

1. A two-way interactive terminal system comprising:
 - a host data processor;
 - a central data store controlled by the host processor for storing a central data base, said central data base comprising a plurality of data items, each of said data items having a preassigned priority value; and
 - at least one local terminal subsystem connectable to the host processor for accessing data items stored in the central data base, said terminal subsystem comprising:
 - a local processor for controlling access to the host processor;
 - memory means controlled by the local processor and comprising a first memory area for storing data items accessed from the central data base;
 - means operable when the first memory area has no vacant space for storing a newly accessed data item to locate a data item in said first memory area for deletion based on the relative priority values of the data items; and
 - means responsive to said locating means to delete the data item located by the locating means to create space in the first memory area for the newly accessed item.
2. The terminal system of claim 1 wherein said memory means further comprises a second memory area for storing a directory entry for each of said data items stored in the first memory area, said directory entries specifying the memory address in said first memory area of each of the data items and being stored in said second memory area in sorted order according to the relative priority of the data items.
3. The terminal system of claim 2 wherein said local terminal subsystem further comprises sorting means for updating and sorting said directory entries whenever the contents of the first memory area are changed.

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4. The terminal system of claim 2 wherein said locating means locates a data item to be deleted by accessing said second memory area.

5. The terminal subsystem of claim 1 further comprising a keyboard for inputting information to the local processor.

6. The terminal subsystem of claim 5 wherein said local processor separately activates a plurality of system features responsive to the actuation of predetermined keys of the keyboard.

7. The terminal system of claim 6 wherein the data items stored in the first memory area comprise a plurality of character screen commands and wherein said terminal subsystem further comprises a character generator, responsive to a character screen command from the local processor, for generating a character display screen for display on an associated television receiver.

8. The terminal system of claim 7 wherein said memory means further comprises a third memory area for storing a channel map containing a plurality of entries, the entries identifying for each of the system features a predetermined keyboard key and a predetermined character screen command, the character screen command being accessed by said local processor for display on the television receiver responsive to actuation of the predetermined key.

9. The terminal system of claim 7 wherein each of the character screen commands has a preassigned feature number corresponding to one of said plurality of system features.

10. The terminal system of claim 9 wherein if said first memory area is full and said local processor has activated a system feature, said locating means locates a data item in said first memory area for deletion having the lowest relative priority value and having a feature number different than the activated feature.

11. The terminal system of claim 9 wherein said character generator, responsive to at least one of said character screen commands, generates a character display screen requiring a keyboard response, and wherein said at least one of said character screen commands includes a pointer specifying another character screen

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12. The terminal system of claim 11 wherein when the feature of said at least one character screen command has been activated, if no space is available in said first memory area for storing a newly accessed item and if all of the character screens stored in said first memory area contain a feature number which is the same as the feature number of said at least one character screen command, said locating means locates a data item in said first memory area, other than said another character screen command, having the lowest relative priority value.

14. In a two-way interactive terminal system comprising a host data processor, a central data store controlled by the host processor for storing a central data base, said data base comprising a plurality of data items, each of the data items having a preassigned priority number, at least one local terminal subsystem connectable to the host processor for accessing data items stored in the central data base, said terminal subsystem comprising a local processor for controlling access to the host processor and memory means controlled by the local processor comprising a first memory area for storing data items accessed from the central data base, a method for controlling the storage of data items in said first memory area comprising the steps of:

determining whether said first memory means contains vacant space for storing a data item accessed from said central data base;

storing said newly accessed data item in said first memory area if vacant space exists in the first memory area; and

locating a data item in said first memory area for deletion based on the relative priority values of the data items and replacing the located data item with the newly accessed data item when no vacant space exists in the first memory area.

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	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
0	0.0000	0.0001	0.0002	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.0011	0.0012	0.0013	0.0014	0.0015	0.0016	0.0017	0.0018	0.0019	0.0020	0.0021	0.0022	0.0023	0.0024	0.0025	0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0042	0.0043	0.0044	0.0045	0.0046	0.0047	0.0048	0.0049	0.0050	0.0051	0.0052	0.0053	0.0054	0.0055	0.0056	0.0057	0.0058	0.0059	0.0060	0.0061	0.0062	0.0063	0.0064	0.0065	0.0066	0.0067	0.0068	0.0069	0.0070	0.0071	0.0072	0.0073	0.0074	0.0075	0.0076	0.0077	0.0078	0.0079	0.0080	0.0081	0.0082	0.0083	0.0084	0.0085	0.0086	0.0087	0.0088	0.0089	0.0090	0.0091	0.0092	0.0093	0.0094	0.0095	0.0096	0.0097	0.0098	0.0099	0.0100

[illegible]

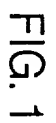
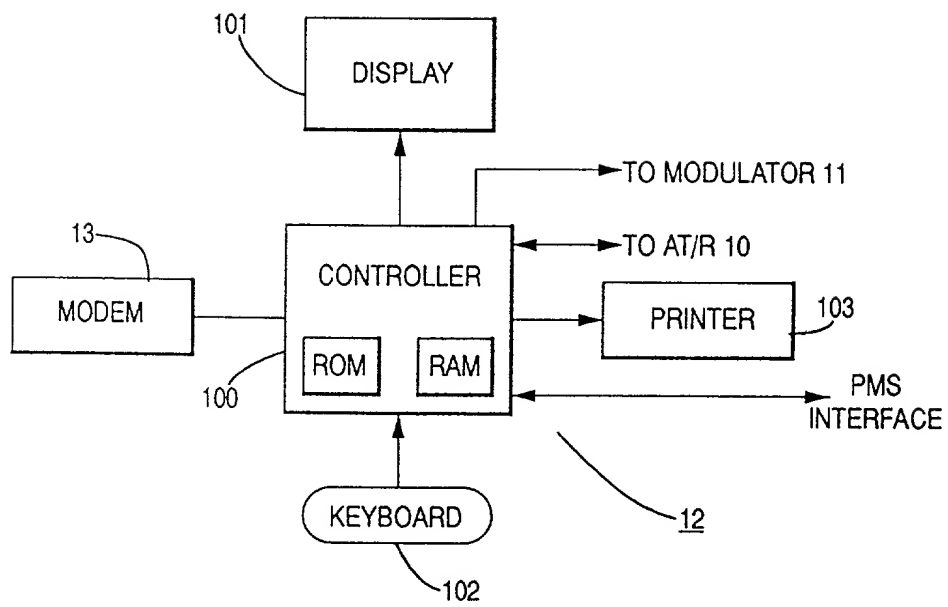


FIG. 1a



[illegible]

FIG. 3

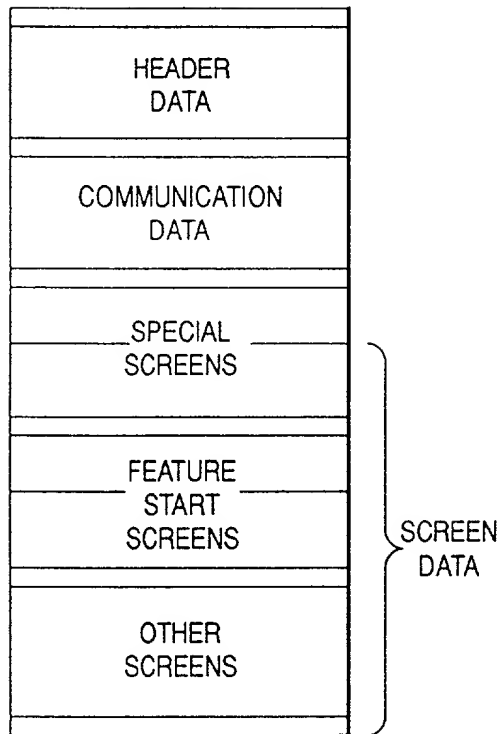


FIG. 7(a)

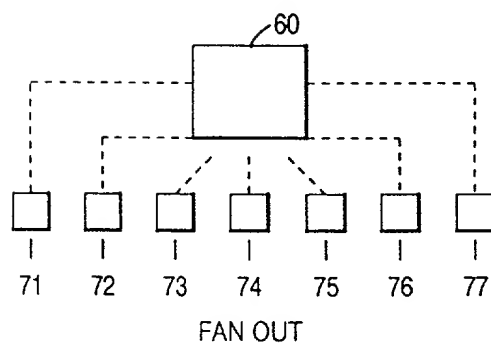
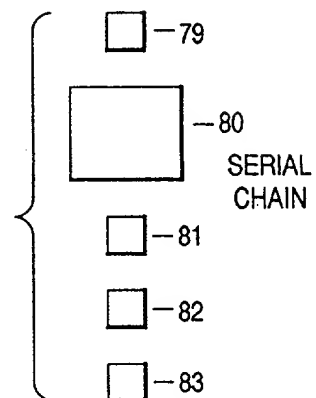


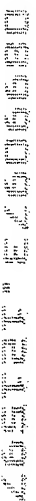
FIG. 7(b)



SCREEN NUMBER	PRIORITY	CANNIBAL BIT	TYPE	AUDIO / VIDEO CHANNEL	AUDIO	FEATURE NUMBER	TIMEOUT	KEY TEMPLATE
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KEY ACTION	GO TO SCREEN
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CHANNEL # 20:
SCREEN # 490 APPEARS:



DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

The residence, post office address and citizenship stated below next to my name is correct; and

I believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought: the invention entitled STORAGE CONTROL METHOD AND APPARATUS FOR AN INTERACTIVE TELEVISION TERMINAL the specification of which

is attached hereto;

X was filed on April 20, 1989 as Application Serial Number 342,987 and was amended on _____ (if applicable);

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above; and

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I further declare that:

I do not know and do not believe that: the invention was known or used in the United States of America before my/our invention thereof; the invention was patented or described in any printed publication in any country before my/our invention thereof or more than one year prior to this application; the invention was in public use or on sale in the United States of America more than one year prior to this application.

I further declare that the invention has not been patented or caused to be patented, or made the subject of an inventor's certificate, issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

Prior Foreign Application(s)

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Country	Application Number	Date of Filing (day, month, year)	Date of Issue (day, month, year)	Priority Claimed Under 35 U.S.C. 119
:	:	:	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
:	:	:	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
:	:	:	:	Yes <input type="checkbox"/> No <input type="checkbox"/>
:	:	:	:	Yes <input type="checkbox"/> No <input type="checkbox"/>

Prior United States Application(s)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial Number	Date of Filing (day, month, year)	Status -- Patented, Pending, Abandoned
:	:	:
07/289/218	23/12/88	PENDING
:	:	:
:	:	:
:	:	:

And I hereby appoint, both jointly and severally, as my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith the following attorneys who are all members of the Bar of the District of Columbia, their registration numbers being listed after their names:

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All correspondence and telephone communications should be addressed to Banner, Birch, McKie and Beckett One Thomas Circle, N.W., Washington, D.C. 20005, telephone number (202) 296-5500, which is also the address and telephone number of each of the above listed attorneys.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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